

ABSTRACT OF THE DISCLOSURE

Disclosed are isolated polynucleotides encoding an omega-3 desaturase and a delta-12 desaturase, the enzymes encoded by the isolated polynucleotides, vectors containing the isolated polynucleotides, transgenic hosts that contain the isolated polynucleotides that express the enzymes encoded thereby, methods for producing the desaturase enzymes, and method of using the enzymes to make polyunsaturated fatty acids. The isolated polynucleotides are derived from a fungus, *Saprolegnia diclina* (ATCC 56851). In particular, omega-3-desaturase may be utilized, for example, in the conversion of arachidonic acid (AA) to eicosapentaenoic acid (EPA). Delta-12 desaturase may be used, for example, in the conversion of oleic acid (OA) to linoleic (LA). EPA or polyunsaturated fatty acids produced therefrom may be added to pharmaceutical compositions, nutritional compositions, animal feeds, as well as other products such as cosmetics.

1. A polynucleotide encoding an omega-3 desaturase.
 2. A polynucleotide encoding a delta-12 desaturase.
 3. A vector containing a polynucleotide of claim 1 or 2.
 4. A transgenic host containing a polynucleotide of claim 1 or 2.
 5. A method for producing a desaturase enzyme, comprising:
 (a) providing a polynucleotide of claim 1 or 2;
 (b) expressing the polynucleotide in a host cell;
 (c) isolating the desaturase enzyme.
 6. A method of using a desaturase enzyme to produce a polyunsaturated fatty acid, comprising:
 (a) providing a desaturase enzyme of claim 1 or 2;
 (b) reacting the desaturase enzyme with a substrate fatty acid;
 (c) isolating the polyunsaturated fatty acid.
 7. A pharmaceutical composition comprising a polyunsaturated fatty acid of claim 6.
 8. A nutritional composition comprising a polyunsaturated fatty acid of claim 6.
 9. An animal feed comprising a polyunsaturated fatty acid of claim 6.
 10. A cosmetic composition comprising a polyunsaturated fatty acid of claim 6.